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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
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EXAMINER

ART UNIT	PAPER
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20060626

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

Notice of Allowability

Application No.

10/731,796

Examiner

Lev I. Iwashko

Applicant(s)

KILIAN ET AL.

Art Unit

2186

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 4/18/2006.
2. ☒ The allowed claim(s) is/are 1-21.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 5/2/2006
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 6/26/2006.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Response to Amendment

1. The new drawings have been acknowledged and are deemed in compliance.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
3. Authorization for this examiner's amendment was given in a telephone interview with Richard Giunta (No. 36,149) on 6/26/2006.
4. The following are Claims 1-24 as they should appear in amended form:
 1. (Amended) A method of processing data in a computer system comprising at least one host and at least one content addressable storage system which stores data for the at least one host, wherein the at least one host accesses data units stored on the at least one storage system using content addresses generated based on the content of the data units, the method comprising:
 - (a) maintaining at least one index that maps a content address of at least one data unit to a storage location within the at least one storage system at which the data unit is stored; and
 - (b) maintaining a cache of the location index;
wherein the act (a) comprises an act of maintaining the location index on at least one magnetic disk, and the act (b) comprises an act of maintaining the cache in a random access memory, and responding to the host during any write request by writing an entry into the cache that states that the write has been completed successfully.
 2. (Cancelled).

3. (Original) The method of claim 1, wherein the at least one storage system includes at least one storage node having at least one storage device and at least one access node that processes access requests from the at least one host, and wherein the act (b) further comprises an act of maintaining the cache on the at least one storage node.

4. (Original) The method of claim 1, wherein the at least one storage system includes at least one storage node having at least one storage device and at least one access node that processes access requests from the at least one host, and wherein the act (b) further comprises an act of maintaining the cache on the at least one access node.

5. (Original) The method of claim 1, wherein the at least one storage system comprises a plurality of storage nodes for storing data received from the at least one host, and wherein the at least one index is stored, at least in part, on at least two of the plurality of storage nodes.

6. (Original) The method of claim 5, wherein a number of the plurality of storage nodes on which the cache of the location index is stored is less than a number of the plurality of storage nodes on which the at least one location index is stored.

7. (Original) The method of claim 6, wherein the cache of the location index is stored on a single one of the plurality of storage nodes

8. (Original) The method of claim 5, wherein the storage system comprises a plurality of access nodes and the cache of the location index is stored on at least one of the plurality of access nodes.

9. (Amended) At least one computer readable medium encoded with instructions that, when executed on a computer system, perform a method of processing data, wherein the computer system comprises at least one host and at least one content addressable

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storage system which stores data for the at least one host, and wherein the at least one host accesses data units stored on the at least one storage system using content addresses generated based on the content of the data units, the method comprising:

(a) maintaining at least one index that maps a content address of at least one data unit to a storage location within the at least one storage system at which the data unit is stored; and

(b) maintaining a cache of the location index;

wherein the act (a) comprises an act of maintaining the location index on at least one magnetic disk, and the act (b) comprises an act of maintaining the cache in a random access memory, and responding to the host during any write request by writing an entry into the cache that states that the write has been completed successfully.

10. (Canceled).

11. The at least one computer readable medium of claim 9, wherein the at least one storage system includes at least one storage node having at least one storage device and at least one access node that processes access requests from the at least one host, and wherein the act (b) further comprises an act of maintaining the cache on the at least one storage node.

12. (Original) The at least one computer readable medium of claim 9, wherein the at least one storage system includes at least one storage node having at least one storage device and at least one access node that processes access requests from the at least one host, and wherein the act (b) further comprises an act of maintaining the cache on the at least one access node.

13. (Original) The at least one computer readable medium of claim 9, wherein the at least one storage system comprises a plurality of storage nodes for storing data received from the at least one host, and wherein the at least one index is stored, at least in part, on at least two of the plurality of storage nodes.

14. (Original) The at least one computer readable medium of claim 13, wherein a number of the plurality of storage nodes on which the cache of the location index is stored is less than a number of the plurality of storage nodes on which the at least one location index is stored.

15. (Original) The at least one computer readable medium of claim 14, wherein the cache of the location index is stored on a single one of the plurality of storage nodes.

16. (Original) The at least one computer readable medium of claim 13, wherein, the storage system comprises a plurality of access nodes and the cache of the location index is stored on at least one of the plurality of access nodes.

17. (Amended) A content addressable storage system for use in a computer system, that includes the content addressable storage system and at least one host, wherein the at least one host accesses data units stored on the content addressable storage system using content addresses generated based on the content of the data units, the content addressable storage system comprising:

at least one storage device to store data received from the at least one host; and

at least one controller that:

maintains at least one index that maps a content address of at least one data unit to a storage location within the content addressable storage system at which the data unit is stored; and

maintains a cache of the location index;

wherein the at least one controller maintains the location index on at least one magnetic disk and maintains the cache in at least one random access memory, and responding to the host during any write request by writing an entry into the cache that states that the write has been completed successfully.

18. (Cancelled).

19. (Original) The content addressable storage system of claim 17, further comprising at least one storage node having the at least one storage device and at least one access node that processes access requests from the at least one host, wherein the at least one controller maintains the cache on the at least one storage node.

20. (Original) The content addressable storage system of claim 17, further comprising at least one storage node having the at least one storage device and at least one access node that processes access requests from the at least one host, wherein the at least one controller maintains the cache on the at least one access node.

21. (Original) The content addressable storage system of claim 17, further comprising a plurality of storage nodes for storing data received from the at least one host, and wherein the at least one index is stored, at least in part, on at least two of the plurality of storage nodes.

22. (Original) The content addressable storage system of claim 21, wherein a number of the plurality of storage nodes on which the cache of the location index is stored is less than a number of the plurality of storage nodes on which the at least one location index is stored.

23. (Original) The content addressable storage system of claim 22, wherein the cache of the location index is stored on a single one of the plurality of storage nodes.

24. (Original) The content addressable storage system of claim 21, wherein the storage system comprises a plurality of access nodes and the cache of the location index is stored on at least one of the plurality of access nodes.

Allowable Subject Matter

1. Claims 1, 2-9, 11-17, and 19-24 are allowed.
2. Claims 2, 10, and 18 are cancelled.
3. The following is an examiner's statement of reasons for allowance: This application refers to an invention in which an index that maps content addresses to physical storage locations is cached on a storage system. The examiner attended an Applicant-initiated telephonic interview, where the applicant brought up a possible amendment to the claims that would make the claims novel. Upon review of the proposed amendments, the Examiner agreed that the proposed amendments were almost in condition for allowance. The Examiner then made a final Examiner Amendment for claims 1, 9, and 17 as shown above.
4. Independent Claims 1, 9, and 17 differ only in being different embodiments of the invention (method, system, or apparatus). Otherwise, the aforementioned claims teach the same concepts. The allowability of Claim 1 will be discussed in detail, with the explanation applying to Claims 9 and 17 as well. The scope of Claim 1 includes maintaining at least one index that maps a content address of at least one data unit to a storage location within the at least one storage system at which the data unit is stored, and maintaining a cache of the location index. The novelty of this invention is shown in the latter part of Claim 1, which states that the location index is maintained on at least one disk, and the maintenance of the cache of the location index must be done in a RAM, and be able to respond to the host during any write request by writing an entry into the cache that states that the write has been completed successfully. The specific combination of the limitations in the claim make it indeed novel, and cannot be overcome by prior art.

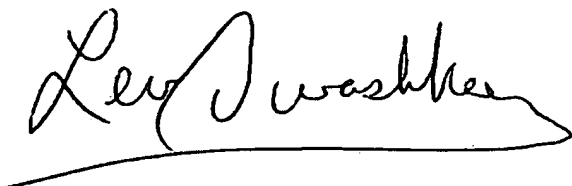
5. All other claims dependent on Claims 1, 9, and 17 are therefore in condition for allowance due to their dependence on the allowable parent claims.
6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion


7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lev I. Iwashko whose telephone number is (571)272-1658. The examiner can normally be reached on M-Th from 8AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim can be reached on (571)272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Lev Iwashko



MATTHEW KIM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100

